



# An Overview of AES Management of Environmental Impact Assessments

*Energy Development in the G.M.S. Conference  
Phnom Penh, Cambodia, September 29-30, 2009*



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# Agenda

- Presentation of the AES Corporation
- Overview of EIA Practices at AES
- Case Study 1: Amman East 380 MW combined cycle plant
- Case Study 2: Mong Duong 1,200 MW greenfield coal project
- Case Study 3: Masinloc 600 MW operating coal-fired plant
- Take aways

# Agenda

## Presentation of the AES Corporation

Overview of EIA Practices at AES

Case Study 1: Amman East 380 MW combined cycle plant

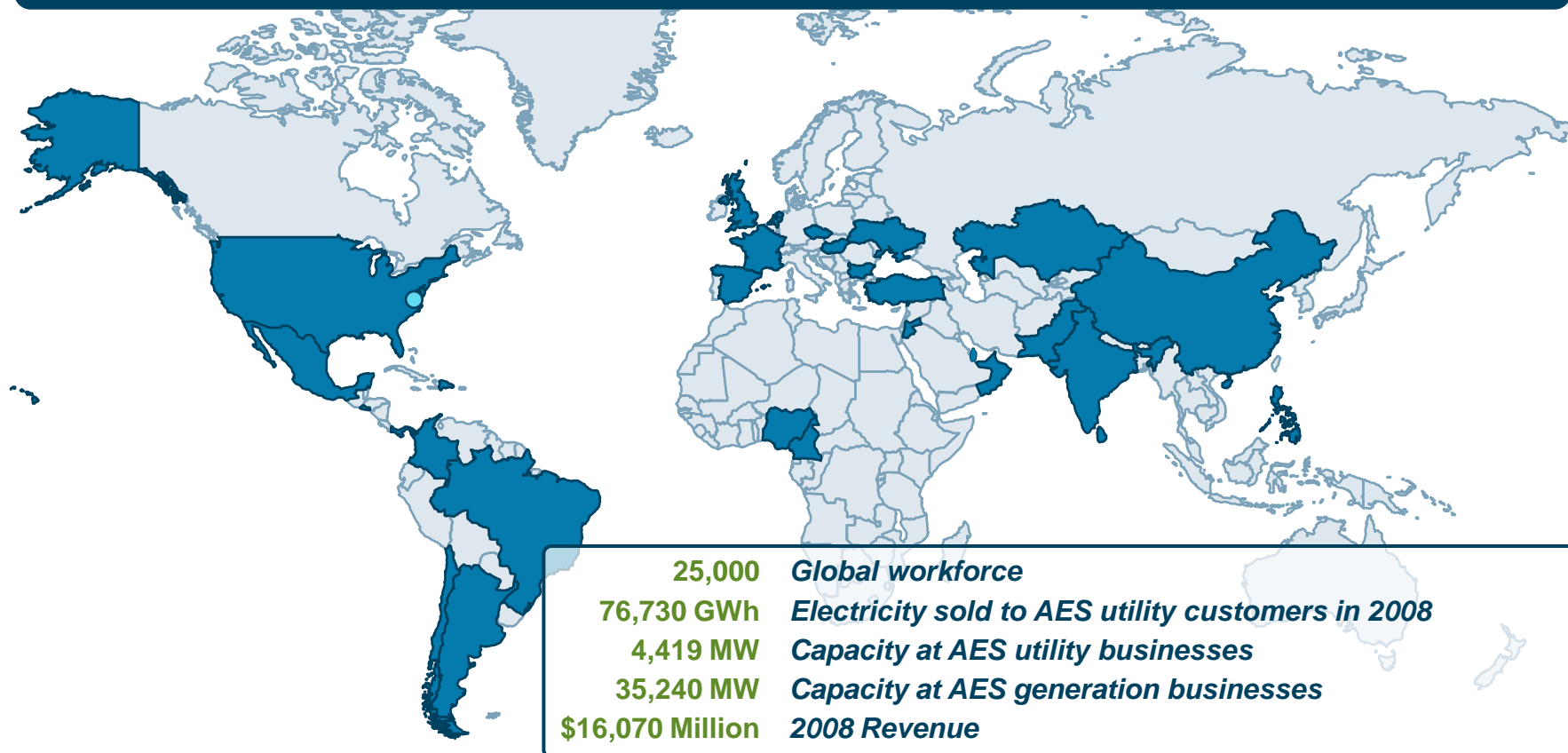
Case Study 2: Mong Duong 1,200 MW greenfield coal project

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Take aways

# About The AES Corporation: Global Operations

The AES Corporation is a Fortune 500 global power company with generation and distribution businesses. Through our diverse portfolio of thermal and renewable fuel sources, we safely provide affordable and sustainable energy in 29 countries.


**Key**
 AES Headquarters

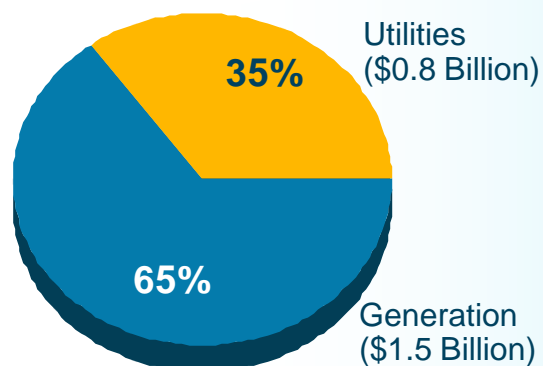

AES Operations

# Key Summary Points About AES

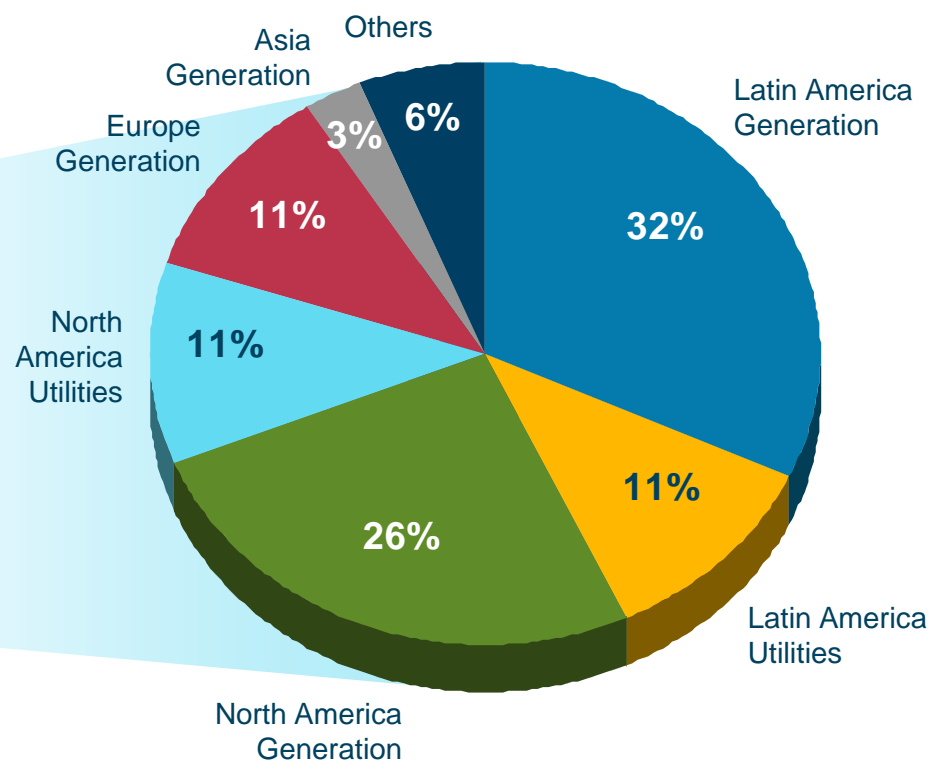
- 
- Diversified mix of businesses results in stable cash flow to the Parent
  - Asset base diversified across
    - ◆ Generation and Utility operations
    - ◆ Multiple markets
    - ◆ Various fuel types and technologies
  - Significant opportunities in global energy going forward
    - ◆ More than 2,500 MW under construction
    - ◆ Development pipeline

# Diverse Portfolio: Businesses in Multiple Markets

**2008 Proportional Gross Margin<sup>1</sup>**  
**(\$2.3 Billion)**



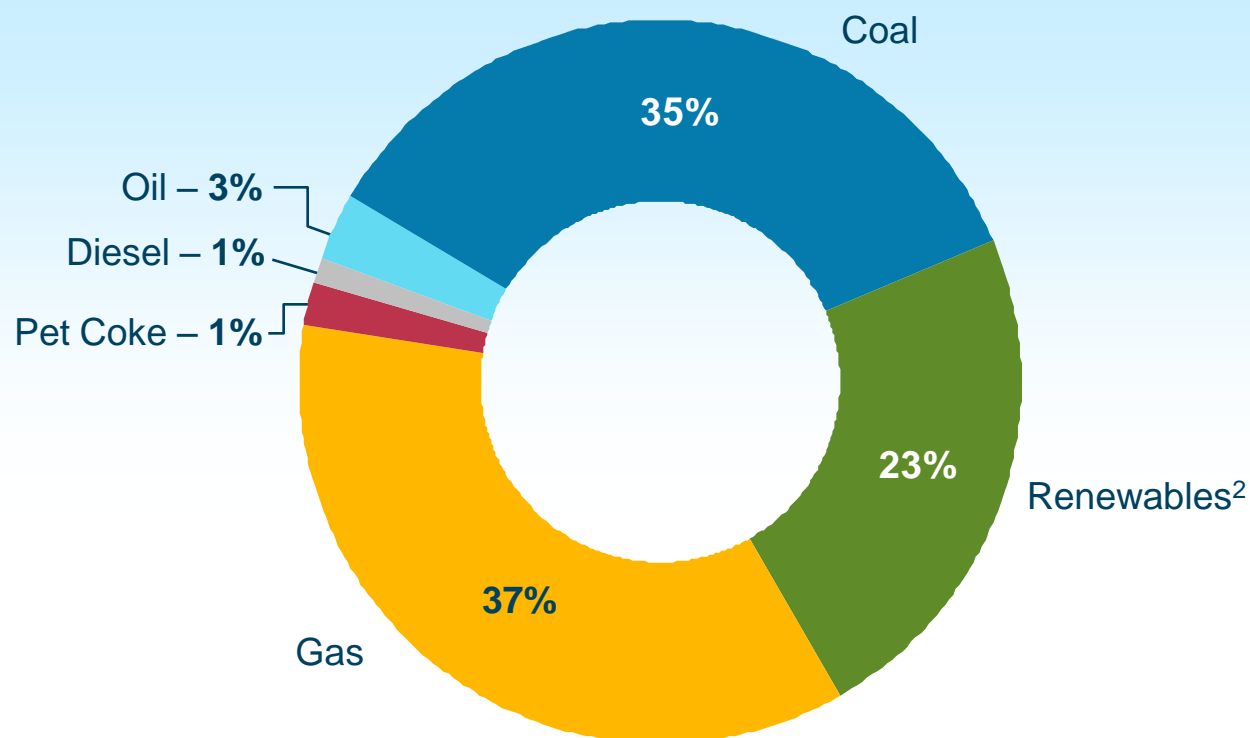
**2008 Proportional Gross Margin<sup>1</sup>**  
**(\$2.3 Billion)**



1. A non-GAAP financial measure. See Appendix for definition and reconciliation.

# Diverse Portfolio: Businesses Utilize Multiple Fuel Types

## Current Portfolio by Fuel Type (MW<sup>1</sup>)



**60% of Our Capacity Is in Natural Gas & Renewables**

1. 39,659 MW (gross) in operation under generation and utilities segments.

2. Renewables include biomass, hydro, solar and wind.



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## AES Vision: Provide Affordable and Sustainable Energy

- World's largest operator of Circulating Fluidized Bed (CFB) technology
  - ◆ 7 CFB plants in North America, total capacity 1,850 MW
  - ◆ CFB technology reduces emissions compared to PC plants
    - SOx: 95% of sulfur captured without the need for external scrubber, with limestone injection in combustion bed
    - NOx: reduced NOx emissions due to lower operating temperature in the boiler (750-900C)
- Strong focus on renewable energy
  - ◆ Wind
    - 1,352 MW in operation (3.4% of total installed capacity)
    - 476 MW in construction (17.4% of plants under construction)
    - 6,400 MW in development pipeline
  - ◆ Solar
    - 32 MW in operation
    - 860 MW in development pipeline

# AES Principles for Environmental Impact Assessment

- Raising the bar for operating plants
  - ◆ Improve emission control systems
    - In New York, AES invested more than \$150 million to emission control projects since 1999
    - AES is currently investing \$50 million at Westover plant in state-of-the-art multi-emission control technology (SO<sub>2</sub>, NO<sub>x</sub>, mercury) especially designed for small-size coal plants
  - ◆ Biomass co-firing
    - Conventional PC boilers can operate with no major modification with 5-10% biomass
    - Projects at various AES plants, including AES Greenidge plant in New York
  - ◆ ISO 14001 certification
    - Most AES plants either certified, or under process of certification
  - ◆ Upgrade recently acquired plants
    - Masinloc 600 MW coal-fired plant in the Philippines (Case Study 3)

# AES Principles for Environmental Impact Assessment

- High standards for greenfield projects
  - ◆ Air emission control
    - Meet the most stringent of World Bank guidelines and local environmental standards
    - Development of Environment Management Plan to monitor equipment and control emissions pre-construction, during construction and operation
    - Holistic approach to CO2 emission control
      - Possibility to offset CO2 emissions with carbon credits produced by AES climate solution group
      - Use of supercritical technology, with higher efficiency
      - Leave option open for carbon capture and sequestration where storage sites are available
  - ◆ Water preservation
    - State-of-the-art waste water treatment plant
    - Water conservation
      - Air-cooled condenser
      - Beneficial use of waste water
      - Optimization of plant water consumption
  - ◆ Corporate Social Responsibility
    - Involvement of all project stakeholders

# Methodology for EIA Study

- EIA scoping
  - ◆ Site visit by EIA team members and meeting with project stakeholders
  - ◆ Identification of issues to be included into EIA study
  - ◆ Finalization of methodologies for primary and secondary data collection
- Secondary data collection and review
  - ◆ Comprehensive literature study to determine existing data on environmental and social conditions in study area
  - ◆ Collection and review of published and unpublished data source across full range of EIA issues
- Primary data collection and review
  - ◆ Terrestrial ecology field survey with focus on species presence
  - ◆ Groundwater, soil, surface water air quality sampling
  - ◆ Noise level calculations
  - ◆ Aquatic ecology field survey
  - ◆ Socio-economic survey of potentially affected households

# Methodology for EIA Study

- Computer simulation and mathematical modeling
  - ◆ Flood, sediment dispersion, air dispersion and thermal plume modeling
- Public consultation and information disclosure
  - ◆ Public meetings and discussions with individual households
- Environmental Impact Assessment
  - ◆ For each of the issues identified during EIA scoping, identification of potential negative and positive impact on surrounding environment
  - ◆ Cumulative and regional impact also identified
- Economic Assessment
  - ◆ Cost/benefit analysis of environmental protection equipments to determine optimal configuration from technico-economic perspective
- Development of Environment Monitoring and Mitigation Plan (EMMP)
  - ◆ Environmental control and monitoring measures during pre-construction, construction, and operation
  - ◆ Developed in consultation with stakeholders (off-taker, suppliers, local authorities)

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Take aways

# Amman East 380 MW Combined Cycle Plant

- Air emissions

- ◆ Use of Dry Low-Nox burners to exceed World Bank standards

|                 | World Bank limit        | Performance Test results |
|-----------------|-------------------------|--------------------------|
| NOx             | 125 mg/Nm <sup>3</sup>  | 40-80 mg/Nm <sup>3</sup> |
| SO <sub>2</sub> | 2000 mg/Nm <sup>3</sup> | 3-5 mg/Nm <sup>3</sup>   |

- Environmental Monitoring and Mitigation Plan (EMMP)

- ◆ Semiannual measurements by third party of air quality, effluent discharge, water quality, noise level, and reporting to lenders and AES Corp
  - ◆ Applies during construction and operation

- Water treatment

- ◆ All effluents treated in automated waste water treatment plant, and sent to Evaporation pond
  - ◆ Water from evaporation pond used for irrigation system and irrigation of tree planting area on plant site



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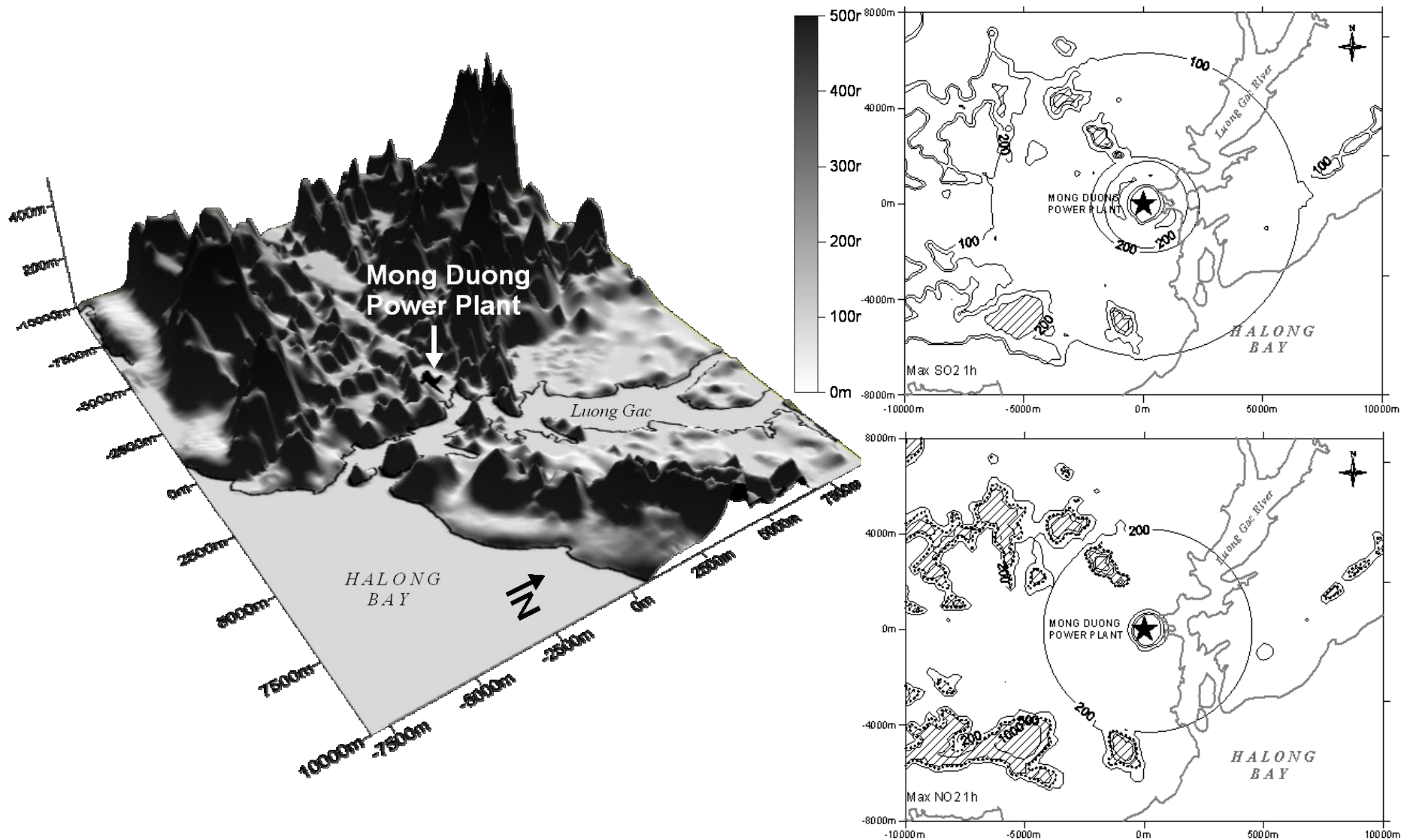
Case Study 3: Masinloc 600 MW operating coal-fired plant

Take aways

# Mong Duong 1,200 MW Greenfield Coal Project

- Mong Duong project
  - ◆ 1,200 MW mine mouth coal-fired project located in Quang Ninh province of Vietnam, using local anthracite coal
  - ◆ Project developed under Build-Own-Transfer scheme by AES and Vinacomin, state-owned coal mining and mineral industries group
- EIA status
  - ◆ EIA approved by Ministry of Natural Resources and Environment (MONRE) in 2007
- Environmental mitigation equipments considered
  - ◆ Wet Flue Gas Desulphurization equipment (limestone)
  - ◆ Selective Catalyst Reactor (SCR) for NOx emission control
  - ◆ Electro-Static Precipitator (ESP) for particulates emission control
  - ◆ Wet ash disposal

# Examples of Air Modeling for Mong Duong



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Take aways

# Masinloc 600 MW Operating Coal-Fired Plant

- Masinloc plant was acquired by AES in April 2008 from PSALM
- The plant had numerous compliance issues
  - ◆ Permitting
  - ◆ Stack emissions (ESPs, CEMS)
  - ◆ Wastewater (treatment plant, stormwater system)
  - ◆ Waste management (ash collection and disposal, solid waste)
  - ◆ Contaminated soil and groundwater, marine impacts
- AES created and executed remediation action plan
  - ◆ Maintain permits
  - ◆ Refurbishment of ESPs and CEMS
  - ◆ Refurbishment of waste water treatment plant
  - ◆ Remediation of contaminated areas
  - ◆ Develop Environmental Monitoring System (EMS)

# Masinloc 600 MW Stack Emissions

Before



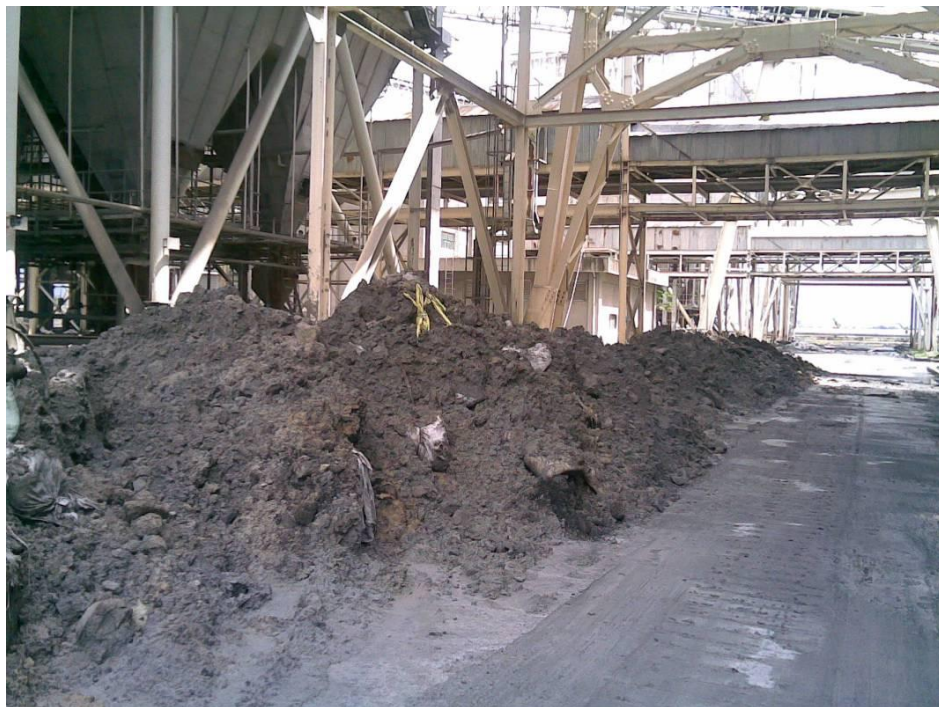
After





# Masinloc 600 MW Ash Collection System

Before



After



# Masinloc 600 MW Ash Collection System

Before



After





# Masinloc 600 MW Coal Storage

Before



After



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**Take aways**

## Key Take Aways

- AES commitment to high environmental standards
  - ◆ For both operating plants (upgrade) and greenfield projects
  - ◆ World Bank standards for emission limits
- EIA an important tool for project developers
  - ◆ Stakeholder consultation (local communities, government authorities, utility and infrastructure providers, interested groups and organization, ...)
  - ◆ Comprehensive review of project environmental impact and management measures
    - Land and soil, groundwater, vegetation and flora, fauna, air quality, noise, social factors, cultural heritage, ...
  - ◆ Environmental Monitoring and Mitigation Plan followed during project operating life